WHAT IS CLAIMED IS:

1. A method for synchronizing a receiver clock with a transmitter clock in a communication system, during transmission of a data signal by a transmitter, comprising:

obtaining estimates of frequency and phase drifts between the transmitter and receiver clocks; and

synchronizing the receiver clock with the transmitter clock based on the estimated phase and frequency drifts.

2. The method of claim 1, wherein synchronizing the receiver and transmitter clocks further comprises:

receiving an input pilot signal of a predetermined frequency and phase, by the receiver from the transmitter;

estimating the frequency and phase drifts between the transmitter and the receiver clocks using the input pilot signal;

computing a clock correction parameter based on the phase and frequency drifts; and

synchronizing the receiver clock with the transmitter clock based on the clock correction parameter.

3. The method of claim 2, wherein synchronizing the transmitter and receiver clocks further comprises:

estimating a window length using the input pilot signal;

forming a window using the window length for sampling the input pilot signal for estimating the frequency and phase drifts;

estimating the frequency and phase drifts between the transmitter and the receiver clocks using the window;

computing the clock correction parameter based on the phase and frequency drifts; and

synchronizing the receiver and transmitter clocks based on the clock correction parameter.

4. The method of claim 3, further comprising:

repeating the estimating, computing, and synchronizing steps above for a next window.

5. The method of claim 3, wherein estimating the frequency drift comprises:

determining a signal-to-noise ratio of the input pilot signal;

estimating the window length based on the signal-to-noise ratio;

forming the window using the window length; and

estimating the frequency drift between the receiver and transmitter clocks using the data signal and the input pilot signal over the window.

6. The method of claim 5, wherein estimating the window length based on the signal-to-noise ratio comprises:

receiving digital samples of the input pilot signal;

outputting a predetermined number of pilot DFT points using the digital samples on a per-frame basis;

estimating the signal-to-noise ratio using the predetermined number of pilot DFT points; and

estimating the window length based on the signal-to-noise ratio.

7. The method of claim 6, wherein estimating the frequency drift comprises:

computing a rate of drift of phase between successive pilot DFT points within the window, wherein the rate of drift of phase is computed by using angular differences between the successive pilot DFT points over the window;

estimating the frequency drift by computing a weighted average of the computed rate of drifts within the window; and

repeating the computing and estimating steps to estimate the frequency drift using a next window.

8. The method of claim 2, wherein estimating the phase drift comprises:

estimating a reference phase;

obtaining an estimate of received signal phase; and

obtaining the phase drift by using the estimate of the received signal phase and the estimated reference phase.

9. The method of claim 8, wherein synchronizing the receiver clock with the transmitter clock further comprises:

synchronizing the receiver clock with the transmitter clock by correcting for the phase drift substantially after correcting for the frequency drift.

10. A method of synchronizing a local receiver clock with a remote transmitter clock in a multi-carrier transmission system, comprising:

obtaining estimates of frequency and phase drifts between the transmitter and receiver clocks; and

synchronizing the local receiver clock with the remote transmitter clock based on the estimated frequency and phase drifts during transmission of a data signal by the remote transmitter.

11. The method of claim 10, wherein synchronizing the receiver and transmitter clocks comprises:

obtaining a window length from an experimental knowledge base;

forming a window using the window length;

estimating the frequency and phase drifts between the transmitter and the receiver clocks using an input pilot signal using the window;

computing a clock correction parameter based on the phase and frequency drift estimates;

synchronizing the receiver and transmitter based on the clock correction parameter; and

repeating the estimating, computing and synchronizing steps above for a next window.

12. The method of claim 11, wherein estimating the frequency drift comprises:

receiving digital samples of the input pilot signal, wherein the input pilot signal is of a predetermined frequency and signal phase from a remote transmitter;

outputting a predetermined number of pilot DFT points using the digital samples on a window length basis;

computing angular differences in phase between successive pilot DFT points within the window; and

estimating the frequency drift by computing a weighted average of the angular differences.

13. The method of claim 11, wherein estimating the phase drift comprises:

obtaining an estimate of the received signal phase; and

obtaining the phase drift by using the estimated received signal phase and a predetermined reference phase.

14. The method of claim 11, wherein estimating the phase drift comprises:

obtaining an estimate of the received signal phase from a first window and using the obtained estimate of the received signal phase as a reference phase;

obtaining an estimate of the received signal phase from a next window; and

obtaining the phase drift by using the estimated received signal phase from the next window and the reference phase; and

repeating the above steps to estimate the phase drift for each subsequent window.

15. A method, comprising:

obtaining estimates of frequency and phase drifts between the transmitter and receiver clocks in a communication system; and

synchronizing the local receiver and the remote transmitter clocks based on the estimated phase and frequency drifts.

16. The method of claim 15, wherein synchronizing the local receiver and remote transmitter clocks comprises:

receiving a pilot signal by the local receiver from the remote transmitter along with a data signal transmitted by the remote transmitter, wherein the pilot signal is of a predetermined frequency and signal phase;

estimating the phase and frequency drifts between the local receiver and the remote transmitter clocks using the pilot signal;

computing a clock correction parameter based on the phase and frequency drift estimates; and

synchronizing the remote transmitter and local receiver clocks based on the clock correction parameter.

17. The method of claim 16, wherein estimating the frequency drift comprises:

obtaining a window length using a prior knowledge base;

forming a window using the window length;

receiving digital samples of the data signal;

outputting a predetermined number of pilot DFT points using the digital samples within the window;

computing angular differences between successive pilot DFT points within the window;

estimating the frequency drift by computing a weighted average of the angular differences within the window; and

repeating the above steps to estimate the frequency drift for each subsequent window.

18. The method of claim 17, wherein estimating the phase drift comprises:

estimating a reference phase of the first window;

obtaining an estimate of the received signal phase of a next window; and

obtaining the phase drift by using the received signal phase and the reference phase.

19. The method of claim 18, wherein estimating the reference phase comprises:

receiving the digital samples of the data signal;

outputting the pilot DFT points using the digital samples on a per-window basis, wherein each pilot DFT point includes a complex number; and

computing an average of the complex numbers within the window to estimate the reference phase.

20. The method of claim 17, wherein estimating the phase drift comprises:

obtaining an estimate of the received signal phase; and

obtaining the phase drift by using the estimated received signal phase and a predetermined reference phase.

21. The method of claim 20, wherein obtaining the estimate of the received signal phase comprises:

receiving the digital samples of the data signal;

outputting the pilot DFT points using the received digital samples on a per-window basis, wherein each pilot DFT point includes a complex number; and

computing an average of the complex numbers of successive pilot DFT points within each window to estimate the received signal phase.

22. The method of claim 18, wherein estimating the phase drift comprises:

comparing the received signal phase with a reference phase to obtain a preliminary phase drift; and

combining the preliminary phase drift with the frequency drift to obtain the phase drift.

23. A clock correction module in a local receiver to synchronize a local receiver clock, in the local receiver, with the remote transmitter clock, in a remote transmitter, in a multi-carrier communication system, while transmitting a data signal by the remote transmitter, comprising:

a data sampler to sample an input pilot signal of a predetermined carrier frequency and phase ;

a frequency drift estimator, coupled to the data sampler, to receive the data signal along with the input pilot signal, and to estimate a frequency drift between the receiver and transmitter clocks using the input pilot signal;

a phase drift estimator, coupled to the data sampler and the frequency drift estimator, to receive the data signal along with the input pilot signal, and to estimate a phase drift between the receiver and transmitter clocks using the input pilot signal;

an analyzer, coupled to the frequency drift estimator and the phase drift estimator, to receive the estimated phase and frequency drifts, and to compute a clock correction parameter based on the received estimated phase and frequency drifts; and

a synchronizing block, coupled to the analyzer, to receive the clock correction parameter, and to adjust the receiver clock to synchronize the receiver clock with the transmitter clock based on the clock correction parameter.

24. The clock correction module of claim 23, wherein the local receiver and the remote transmitter comprise a Digital-to-Analog Converter (DAC) and an Analog-to-Digital Converter (ADC), wherein the clock correction module to synchronize the local receiver ADC and DAC clocks with the remote transmitter ADC and DAC clocks using the clock correction parameter.

25. The clock correction module of claim 23, wherein the frequency drift estimator computes a signal-to-noise ratio of the received input pilot signal, wherein the frequency drift estimator estimates a window length based on the signal-to-noise ratio, and forms a window using the window length, and wherein the frequency drift estimator estimates the frequency drift between the transmitter and receiver clocks using the received data signal over the window length.

26. The clock correction module of claim 25, further comprising:

a DFT module, wherein the DFT module is coupled to the data sampler, wherein the DFT module receives digital time domain samples of the received input pilot signal and outputs a predetermined number of pilot DFT points using the digital time domain samples for each window, wherein the frequency drift estimator receives the predetermined number of pilot DFT points associated with each window and estimates the signal-to-noise ratio using the predetermined number of pilot DFT points.

27. The clock correction module of claim 26, wherein the frequency drift estimator computes angular differences in the signal phase between successive pilot DFT points within a first window, and wherein the frequency drift estimator

estimates the frequency drift by computing a weighted average of the angular differences in the signal phase, wherein the local receiver clock is adjusted to the remote transmitter clock by using the estimated frequency drift.

28. The clock correction module of claim 27, wherein the frequency offset is computed over a second window and the local receiver clock is corrected using the estimated frequency offset during the second window, and wherein the phase drift estimator estimates a reference phase using the second window.

29. The clock correction module of claim 28, wherein the frequency offset is computed over a third window and the local receiver clock is corrected using the estimated frequency offset during the third window, wherein the phase drift estimator obtains an estimate of the sampled signal phase using a third window, wherein the phase drift estimator further obtains the phase drift by using the estimate of the sampled signal phase and the reference phase, and wherein the clock correction module obtains a clock correction parameter using the estimated phase and frequency drifts and applies the clock correction parameter to the local receiver clock to synchronize the local receiver clock with the remote transmitter clock.

30. An apparatus for synchronizing local and remote transceiver clock signals in a communicating system, comprising:

a data sampler to sample an input pilot signal along with a data signal, wherein the input pilot signal is of a predetermined carrier frequency and phase;

a frequency drift estimator, coupled to the data sampler, to receive the data signal and the input pilot signal, and to estimate a frequency drift between the local and remote transceiver clocks using the input pilot signal;

a phase drift estimator, coupled to the data sampler and the frequency drift estimator, to receive the data signal and the input pilot signal, and to estimate a

phase drift between the local and remote transceiver clocks using the input pilot signal;

an analyzer, coupled to the frequency drift estimator and the phase drift estimator, to receive the estimated phase and frequency drifts, and to compute a clock correction parameter based on the received estimated phase and frequency drifts; and

a synchronizing block, coupled to the analyzer, to receive the clock correction parameter, and to adjust the local transceiver clock with respect to the input pilot signal, to synchronize the local transceiver clock to the remote transceiver clock, based on the clock correction parameter.

31. The apparatus of claim 30, wherein the frequency drift estimator obtains a window length from an experimental knowledge base and forms a window using the window length, wherein the frequency drift estimator receives digital samples of the transmitted data signal, and wherein the frequency drift estimator outputs pilot DFT points using the digital samples on a per-window basis, wherein the frequency drift estimator computes angular differences in phase between successive pilot DFT points within the first window, and wherein the frequency drift estimator estimates the frequency drift by computing a weighted average of the angular differences.

32. The apparatus of claim 31, wherein the phase drift estimator obtains an estimate of the sampled signal phase in the second window, and wherein the phase drift estimator obtains the phase drift by using the estimated sampled signal phase and a predetermined reference phase.

33. The apparatus of claim 32, wherein the frequency drift estimator and the phase drift estimator estimate frequency drift and phase drift, respectively, for each window length, wherein the synchronizing block applies the clock correction

parameter to synchronize the local and remote transceiver clocks during each associated window length.

34. An article comprising a computer-readable medium which stores computer-executable instructions, the instructions causing a computer to:

receiving an input pilot signal, of a predetermined frequency, amplitude, and signal phase, by the receiver clock from the remote transmitter;

estimating the frequency and phase drifts between the transmitter and the receiver clocks using the input pilot signal;

computing a clock correction parameter based on the phase and frequency drift estimates; and

synchronizing the local receiver clock with the remote transmitter clock based on the clock correction parameter.

35. The article comprising the computer-readable medium which stores computer-executable instructions of claim 34, further comprising:

repeating the estimating, computing and synchronizing steps above for each window length.

36. The article comprising the computer-readable medium which stores computer-executable instructions of claim 34, wherein the instructions to estimate the frequency drift further cause a computer to:

determining a signal-to-noise ratio of the input pilot signal;

estimating the window length based on the signal-to-noise ratio;

forming a window using the estimated window length; and

estimating the frequency drift between the transmitter and receiver clocks using the data signal and the input pilot signal over the window.

37. The article comprising the computer-readable medium which stores computer-executable instructions of claim 34, wherein the instructions to estimate the phase drift further cause a computer to:

estimating a reference phase;

obtaining an estimate of received signal phase; and

obtaining the phase drift by using the received signal phase and the estimated reference phase.

38. A computer system for synchronizing clock signals in a communication system used in a multi-carrier system, comprising:

a bus;

a processor coupled to the bus;

a memory coupled to the processor;

a data sampler to sample an input pilot signal of a predetermined carrier frequency and phase;

a frequency drift estimator, coupled to the data sampler, to receive a data signal along with the input pilot signal, and to estimate a frequency drift between receiver and transmitter clocks using the input pilot signal;

a phase drift estimator, coupled to the data sampler and the frequency drift estimator, to receive the data signal along with the input pilot signal, and to estimate a phase drift between the receiver and transmitter clocks using the input pilot signal;

an analyzer, coupled to the frequency drift estimator and the phase drift estimator, to receive the estimated phase and frequency drifts, and to compute a clock correction parameter based on the received estimated phase and frequency drifts; and

a synchronizing block, coupled to the analyzer, to receive the clock correction parameter, and to adjust the receiver clock to synchronize a receiver clock with a transmitter clock based on the clock correction parameter.

39. The system of claim 38, wherein the frequency drift estimator computes a signal-to-noise ratio of the received data signal, wherein the frequency drift estimator estimates a window length based on the signal-to-noise ratio, and forms a window using the window length, and wherein the frequency drift estimator estimates the frequency drift between the transmitter and receiver clocks using the received data signal over the window.

40. The system of claim 39, wherein the frequency drift estimator estimates the frequency drift during the first window and corrects the local receiver clock using the estimated frequency drift, wherein the frequency drift estimator estimates the frequency drift again during a second window and corrects the local receiver clock with the estimated frequency drift during the second window, wherein the phase drift estimator estimates a reference phase using the second window, wherein the phase drift estimator obtains an estimate of the sampled signal phase during the second window, and wherein the frequency drift estimator further computes the frequency drift during a third window, wherein the phase drift estimator obtains the phase drift by using the estimate of the sampled signal phase and the reference phase during the third window, and wherein the analyzer computes a clock correction parameter using the estimated frequency and phase drifts and corrects the local receiver clock using the clock correction parameter.

41. An apparatus for synchronizing local and remote transceiver clock signals in a communicating system, comprising:

means to sample an input pilot signal along with a data signal, wherein the sample input pilot signal is of a predetermined carrier frequency and phase;

means to receive the data signal and the input pilot signal, and to estimate a frequency drift between the local and remote transceiver clocks using the input pilot signal;

means to receive the data signal and the input pilot signal, and to estimate a phase drift between the local and remote transceiver clocks using the input pilot signal;

means to receive the estimated phase and frequency drifts, and to compute a clock correction parameter based on the received estimated phase and frequency drifts; and

means to adjust the local transceiver clock with respect to the input pilot signal, to synchronize the local transceiver clock to the remote transceiver clock, based on the clock correction parameter.